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Chapter 83: Pregnancy and Lactation

INTRODUCTION

- Medication use in pregnancy and lactation is complex. Clinicians must ensure appropriate therapy throughout pregnancy and after delivery. Sometimes, treatments differ from those for nonpregnant patients. While many medication dosages are the same, some require adjustments. Lactation medication principles are similar but not identical to pregnancy.
- The American College of Obstetricians and Gynecologists (ACOG) and the International Lactation Consultants Association recommend using nongendered terms. All gendered terms refer to biological sex, not gender.

MEDICATION SELECTION DURING PREGNANCY

- The incidence of congenital malformation is approximately 3%–5%, with less than 1% of all birth defects caused by medication exposure.
- Medications are often needed during pregnancy for acute and chronic conditions. Strategies to optimize health and minimize fetal risk include identifying medication use before contraception, eliminating nonessential drugs, discouraging self-medication, minimizing exposure to harmful medications, and adjusting doses.
- Medication adverse effects on the fetus depend on dosage, administration route, and pregnancy stage at exposure.
- Exposure to a teratogen in the first 4 weeks after conception may have an "all or nothing" effect, potentially destroying the embryo or having no effect.
- During organogenesis, when organ systems are developing, teratogenic exposures might cause structural anomalies. These include methotrexate, cyclophosphamide, some sex hormones (eg, androgens), lithium, retinoids, thalidomide, warfarin, and certain antiseizure medications.
- Exposure after this point may cause growth retardation, CNS or other abnormalities, or death. **Nonsteroidal anti-inflammatory drugs** (NSAIDs) and **tetracyclines** are more likely to have effects in the second or third trimester.
- Resources on medications in pregnancy and lactation include the FDA website for the "Pregnancy and Lactation Labeling Rule," primary literature, tertiary compendia, textbooks, and computerized databases.

PRECONCEPTION PLANNING

- **Folic acid**, at least 0.4 mg daily, is recommended during reproductive years to reduce neural tube defect (NTD) risk. For high NTD risk, use 4 mg daily starting 3 months before conception until 12 weeks' gestation. This includes individuals with personal, partner, or previous pregnancy NTD history.
- The goal of preconception care is to optimize health and well-being, improve pregnancy outcomes, and enhance the future child's health.
- Key components of preconception planning include health promotion and patient education. Information on maintaining a balanced diet, staying active, managing stress, and avoiding alcohol, tobacco, and drugs is shared to empower patients and improve pregnancy outcomes.

ACUTE PREGNANCY ISSUES

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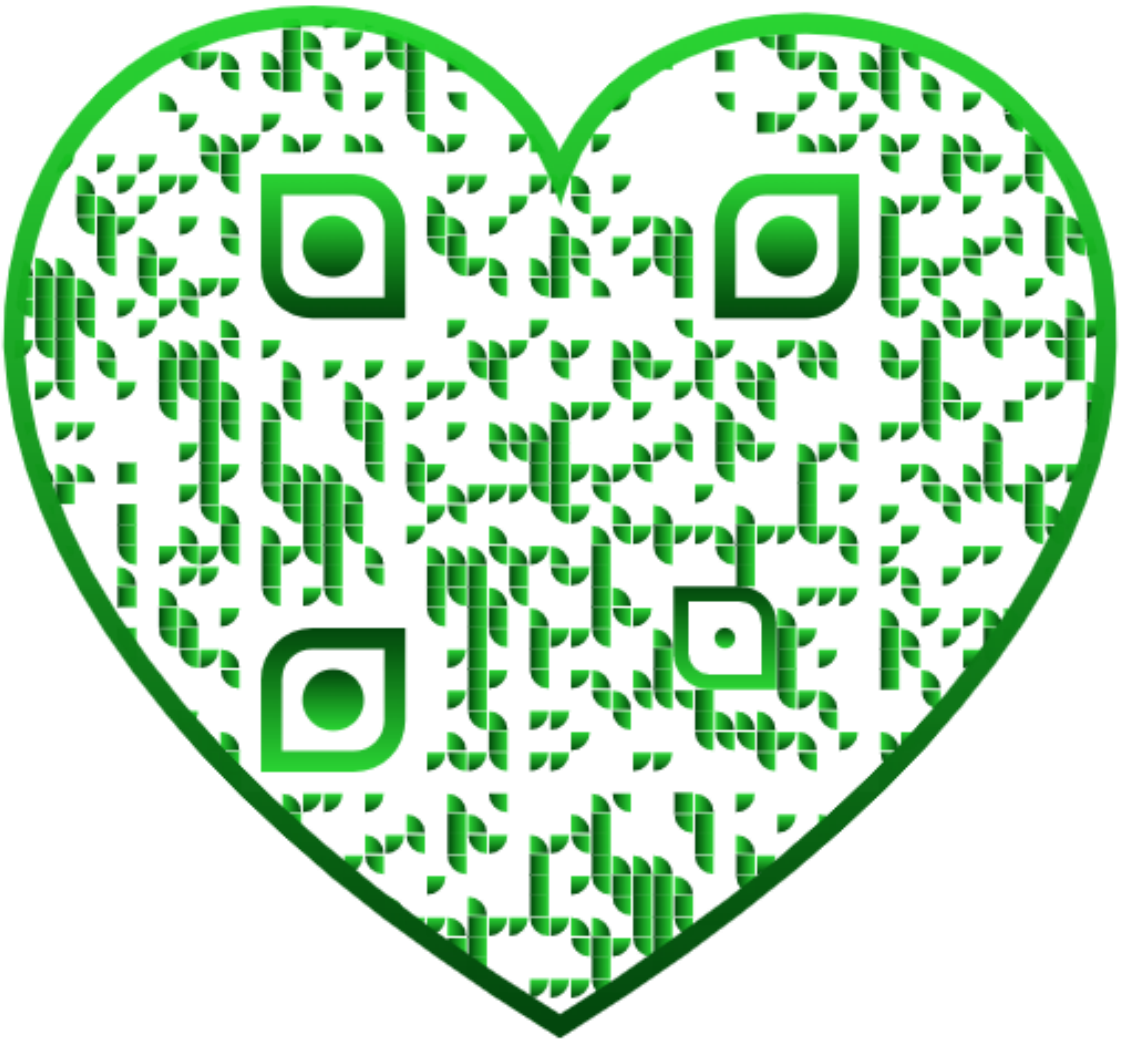

Gastrointestinal Tract

- Therapy for gastroesophageal reflux includes nonpharmacologic methods such as lifestyle and dietary modifications (small, frequent meals; avoiding alcohol, tobacco, caffeine; avoiding food before bedtime; elevating the head of the bed) alone or with medications. If needed, initiate **aluminum**, **calcium,** or **magnesium antacids**; **sucralfate; cimetidine;** or **ranitidine**. Proton pump inhibitors are options if the response to histamine 2 (H_2)–receptor blockers is inadequate. Avoid **sodium bicarbonate** and **magnesium trisilicate**.

- Nonpharmacologic treatments for nausea and vomiting include reflux management, acupressure, and trigger avoidance. Pharmacotherapy may include **ginger**, antihistamines (eg, **doxylamine**), and **pyridoxine**. The ACOG considers pyridoxine alone or with doxylamine as first line. Second-line options include **dimenhydrinate, diphenhydramine**, **prochlorperazine,** and **promethazine**. Third-line options are **metoclopramide**, **ondansetron**, and **trimethobenzamide**. Metoclopramide and phenothiazines can cause sedation and extrapyramidal effects; ondansetron may cause oral clefts.

- **Corticosteroids** can be effective for hyperemesis gravidarum (severe nausea and vomiting causing over 5% prepregnancy weight loss, dehydration, and ketonuria) but are reserved until after 10 weeks due to the risk of oral clefts.

- Constipation is common during pregnancy. Implement education, physical exercise, and increased intake of dietary fiber and fluids. If needed, provide **supplemental fiber** or a stool softener. **Polyethylene glycol**, **lactulose,** and **sorbitol** can be used intermittently. **Senna** and **bisacodyl** are also occasional options. **Magnesium** and **sodium salts** may cause an electrolyte imbalance. Avoid **castor oil** and **mineral oil**.

- Therapy for hemorrhoids includes increasing dietary fiber and hydration. If inadequate, use laxatives and stool softeners. Topical anesthetics, skin protectants, and astringents may alleviate irritation and pain. Topical hydrocortisone can reduce inflammation and itching.

Diabetes in Pregnancy

- All pregnant individuals not previously diagnosed with type 1 or 2 diabetes should be screened between 24 and 48 weeks gestation. High-risk individuals should be screened at the first visit.

- **Table 83-1** summarizes the screening and diagnosis of gestational diabetes mellitus (GDM) using different approaches.

- Medical nutrition therapy, exercise, and blood glucose monitoring are considered first-line therapies.

- Daily self-monitoring of blood glucose is recommended for all pregnant individuals with diabetes. Testing at least four times daily is generally recommended, sometimes up to seven. Continuous glucose monitoring is increasingly used during pregnancy, especially in those with type 1 diabetes.

- Medication therapy is indicated if fasting glucose levels consistently exceed 95 mg/dL, 1-hour postprandial levels exceed 140 mg/dL, or 2-hour postprandial levels exceed 120 mg/dL.

- **Human insulin** is the first-line choice for managing diabetes during pregnancy as it does not cross the placenta. **Glyburide** and **metformin** are alternatives but do cross the placenta to some degree.

- A 2-hour oral glucose tolerance test (OGTT) between 4 and 12 weeks postpartum is recommended for those with GDM to diagnose previously unrecognized type 2 diabetes.

- Recommendations suggest that patients with GDM be screened for type 2 diabetes during the immediate postpartum period while hospitalized using the one-step 75-g oral glucose tolerance test.

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TABLE 83-1

Screening and Diagnosis of Gestational Diabetes Mellitus

One-Step Method
Complete a 75-g OGTT with plasma glucose assessed at fasting, 1 hour, and 2 hours. Perform the test in the morning after an overnight fast of at least 8 hours. GDM is diagnosed when one or more of the following plasma glucose levels are met or exceeded: Fasting: 92 mg/dL; 1 hour: 180 mg/dL; 2 hour: 153 mg/dL
Two-Step Method
Step 1: Complete a nonfasting 50-g oral glucose loading test, assessing plasma glucose after 1 hour. If plasma glucose is ≥140 mg/dL,[a] the patient proceeds to **step 2**.
Step 2: Complete a 100-g OGTT with plasma glucose assessed at fasting, 1, 2, and 3 hours. GDM is diagnosed when at least two of these plasma glucose levels are met or exceeded: Fasting: 95 mg/dL; 1 hour: 180 mg/dL; 2 hour: 155 mg/dL; 3 hour: 140 mg/dL

GDM, gestational diabetes mellitus; OGTT, oral glucose tolerance test.

[a]A lower threshold of 130 or 135 mg/dL may be utilized by some providers; the American Diabetes Association recommends 140 mg/dL.

Hypertension

- Hypertensive (HTN) disorders of pregnancy (HDP) include (1) chronic HTN, existing before 20 weeks of gestation; (2) gestational HTN without proteinuria, developing after 20 weeks; (3) preeclampsia, HTN with proteinuria, that may be the first symptom of an HTN disorder during pregnancy; and (4) chronic HTN with superimposed preeclampsia.
- Eclampsia, a medical emergency, involves preeclampsia with seizures. Pregnancy HTN is SBP over 140 mm Hg or DBP over 90 mm Hg based on two or more measurements at least 4 hours apart. Severe HTN is two readings of SBP >160 mm Hg and/or DBP >110 mm Hg at least 15 minutes apart.
- Nonpharmacologic management of HDP includes stress reduction and light exercise or activity restriction. Exercising over 50 minutes, 3 days a week, can reduce HTN incidence threefold compared to more sedentary individuals.
- For those at risk of preeclampsia, taking **aspirin** (81–162 mg/day) starting at weeks 12–28 lowers the risk of preeclampsia, preterm birth, intrauterine growth restriction, and perinatal mortality.
- **Magnesium sulfate** during active labor and for 12–24 hours postpartum reduces the risk of eclampsia and treats seizures. **Benzodiazepines** and **phenytoin** are alternatives for those contraindicated for magnesium.
- Pharmacologic therapy is recommended with persistent blood pressures of ≥160 mm Hg SBP and/or 110 mm Hg DBP. Chronic HTN can lead to complications, fetal growth restriction, and hospital admission.
- When using antihypertensive therapy, maintain SBP between 120 and 160 mm Hg and DBP between 80 and 105 mm Hg. If there is no end-organ damage with SBP <160 mm Hg and DBP <105 mm Hg, pharmacologic therapy isn't recommended.
- Severe pregnancy hypertension requires treatment, with BP reduction over hours to avoid uteroplacental flow issues. **Labetalol** and **nifedipine** are recommended, though labetalol can cause bronchoconstriction, and nifedipine needs twice-daily dosing. **Hydrochlorothiazide** is second or third line. Use **clonidine** and **prazosin** when monitored by specialists. **Atenolol,** angiotensin-converting enzyme (ACE) inhibitors, **angiotensin II receptor blockers** (ARBs), **renin inhibitors and mineralocorticoid receptor antagonists** are not recommended. Magnesium sulfate

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use is limited, except for preeclampsia. Reserve IV labetalol, IV/IM hydralazine, or immediate-release nifedipine for urgent cases.

Thyroid Disorders

- Gestational transient thyrotoxicosis may occur, but antithyroid medication is typically not needed.
- For hypothyroidism in pregnancy, start levothyroxine at 0.1 mg/day. Those already on thyroid therapy may need higher doses. Monitor thyroid stimulating hormone (TSH) every 4–6 weeks for dose adjustments.
- Hyperthyroidism treatment includes thioamides (eg, **methimazole, propylthiouracil)** to achieve free thyroxine near the upper normal limit.

Thromboembolic Disorders

- For acute venous thromboembolism (VTE) during pregnancy, use **low-molecular-weight heparin** (LMWH) over unfractionated **heparin** or **warfarin**. Continue throughout pregnancy and 6 weeks postpartum, with a minimum of 3 months total therapy. Consider **fondaparinux** if heparin is unsuitable. Avoid **dabigatran, rivaroxaban,** and **apixaban** due to limited data, and warfarin due to fetal risks.
- For those at moderate or high risk of recurrent VTE, use antepartum LMWH or heparin plus 6-week postpartum LMWH or warfarin. Consult guidelines for patients with prosthetic heart valves, thrombophilias, and very high VTE risk.

ACUTE CARE ISSUES IN PREGNANCY

Headache

- For tension and migraine headaches during pregnancy, first-line therapies are nonpharmacologic: relaxation, stress management, avoiding triggers, and cognitive behavioral therapy.
- For tension headaches, acetaminophen is the preferred treatment. Not all **NSAIDs** and **aspirin** are recommended and contraindicated after 20 weeks of gestation due to prostaglandin inhibition. Antiemetics may be used for nausea and vomiting. **Opioids** are rarely used.
- For migraines, acetaminophen and antiemetics (eg, **metoclopramide**) are commonly used. Acetaminophen with **caffeine** is an option, but limit caffeine to 200 mg. **Opioids** can cause nausea and lead to neonatal withdrawal if used for long term. For nonresponsive migraines, triptans (eg, **sumatriptan)** can be used. Ergotamine and dihydroergotamine are contraindicated.
- Dietary supplements, riboflavin, and magnesium may be used for migraine prevention.
- Secondary headaches, indicating serious underlying conditions, can result from preeclampsia, stroke, postdural puncture, cerebral angiopathy, and cerebral venous thrombosis.

Urinary Tract Infection

- The principal infecting organism is *Escherichia coli*. Untreated bacteriuria may result in pyelonephritis, preterm birth, and low birth weight.
- Treatment of asymptomatic bacteriuria is necessary to reduce the risk of pyelonephritis and premature delivery. Treatment of asymptomatic bacteriuria and cystitis for 3–7 days is common.
- The most commonly used antibiotics for asymptomatic bacteriuria and cystitis are the β-lactams (penicillins and cephalosporins) and nitrofurantoin. *E. coli* resistance to **ampicillin** and **amoxicillin** is problematic. **Nitrofurantoin** is not active against *Proteus* and should not be used after week 37 in patients with glucose-6-phosphate dehydrogenase deficiency due to concern for hemolytic anemia in the newborn. **Sulfa-containing medications** may increase the risk for kernicterus in the newborn and should be avoided during the last weeks of gestation. **Folate antagonists**, such as **trimethoprim,** are relatively contraindicated during the first trimester because of their association with cardiovascular malformations. Regionally, increased rates of *E. coli* resistance to trimethoprim-sulfa limit its use. Single-dose **fosfomycin** may also be considered. **Fluoroquinolones** and **tetracyclines** are contraindicated.

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- Inpatient therapy for pyelonephritis includes parenteral administration of broad spectrum beta-lactam antibiotics (eg, **cefepime**, **ceftriaxone**, **ampicillin plus gentamicin**) as preferred treatment. Switching to oral antibiotics can occur after the patient is afebrile for 24 hours, but avoid nitrofurantoin, fosfomycin, and fluoroquinolones.
- Prophylactic or suppressive antibiotics (eg, nitrofurantoin, cephalexin) may be considered in patients with recurrent cystitis or pyelonephritis.

Sexually Transmitted Infections

- Pharmacotherapy for selected sexually transmitted infections (STIs) is shown in **Table 83-2**.
- Screening for STIs should occur at the first prenatal visit, with follow-up testing for some diseases.
- *Chlamydia trachomatis* can be transmitted at birth, causing conjunctivitis and subacute, afebrile pneumonia in the neonate.
- **Benzathine penicillin** Gtreats all syphilis stages except neurosyphilis, which uses aqueous **penicillin G**. Penicillin prevents transmission to the fetus and treats an infected fetus.
- Neonatal *Neisseria gonorrhoeae* symptoms (eg, rhinitis, vaginitis, urethritis, ophthalmia neonatorum, sepsis) appear at 2–5 days old. To prevent blindness, all neonates receive ocular erythromycin within 24 hours. Due to common *Chlamydia* coinfection, gonorrhea treatment usually includes *Chlamydia* treatment.
- The main concern with genital herpes is neonatal transmission during birth. **Acyclovir** and **valacyclovir** are recommended but need more frequent dosing due to increased renal elimination.
- Bacterial vaginosis, caused by anaerobes, mycoplasmas, and *Gardnerella vaginalis,* isn't an STI. Untreated, there is an increased risk for premature rupture of membranes, preterm labor, preterm birth, intra-amniotic infection, and postpartum endometritis.
- Trichomoniasis raises the risk of premature rupture of membranes, early delivery, and low birth weight. Treatment may prevent neonatal respiratory or genital infection.
- Pregnant individuals without hepatitis A or B immunity should receive the hepatitis B vaccine; the hepatitis A vaccine is recommended if they are at increased risk.

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TABLE 83-2

Management of STIs in Pregnancy

STI	Recommended Therapy	Alternative Therapy
Bacterial vaginosis	Metronidazole 500 mg orally twice daily for 7 days Metronidazole 0.75% gel 5 g intravaginally once daily for 5 days Clindamycin 2% cream 5 g intravaginally at bedtime for 7 days	Clindamycin 300 mg orally twice daily for 7 days Clindamycin ovules 100 mg intravaginally at bedtime for 3 days
Chlamydia	Azithromycin 1 g orally for 1 dose	Amoxicillin 500 mg orally three times a day for 7 days
Genital herpes	Acyclovir 400 mg orally three times a day Valacyclovir 500 mg orally twice daily	
Gonorrhea	Ceftriaxone 500 mg IM for 1 dose; treat for chlamydia as well, if not yet excluded	Consult an infectious disease or STI specialist if cephalosporins can't be used (ie, allergy)
Syphilis[a]		
Primary, secondary, early latent	Benzathine penicillin G 2.4 million units IM for 1 dose; a second dose 1 week later may reduce congenital syphilis risk	
Tertiary,[b] late latent[c]	Benzathine penicillin G 2.4 million units IM for 3 doses at 1-week intervals	
Trichomoniasis	Metronidazole 500 mg orally twice daily for 7 days	

CSF, cerebrospinal fluid; g, grams; IM, intramuscular; IV, intravenous; mg, milligrams; STI, sexually transmitted infection.

[a]Pregnant individuals with a history of penicillin allergy should undergo penicillin desensitization as no proven alternatives exist.

[b]With normal cerebrospinal fluid examination.

[c]If a patient misses a dose (ie, greater than 9 days between doses), the series needs to be restarted.

CHRONIC ILLNESSES IN PREGNANCY

Allergic Rhinitis and Asthma

- Diagnosis and staging of asthma during pregnancy are the same as for nonpregnant individuals, but more frequent follow-ups are needed. Medication risks to the fetus are smaller than the risks of untreated asthma.
- Medication risks to the fetus are lower than untreated asthma risks; therefore, using medications to achieve and maintain control is warranted.
- Guidelines recommend continuing **inhaled corticosteroids** for those planning or currently pregnant. **Long-acting β_2-agonists** are safe. During pregnancy, patients should have rescue therapy (eg, **short-acting inhaled β_2-agonist**) for symptom management.
- First-line treatment for allergic rhinitis includes avoiding allergens and immunotherapy.

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- **Oral antihistamines**, **leukotriene receptor antagonists**, and **intranasal antihistamines**, **decongestants** (limited duration), **cromones**, and **corticosteroids** can be used.
- Immunotherapy isn't contraindicated but shouldn't start for the first time during pregnancy due to anaphylaxis risk.

Epilepsy

- The risks of untreated epilepsy to the fetus are greater than those associated with antiseizure medications (ASMs).
- Since some organs form early in gestation, switching to a preferred therapy is ideal before pregnancy.
- Antiseizure medication monotherapy is recommended, with regimen optimization before conception.
- Teratogenic effects of ASMs, such as **valproic acid**, and potentially **carbamazepine, lamotrigine,** and **phenobarbital,** are dose-related, with risks increasing above a certain threshold.
- Valproic acid should be avoided due to high risks of neural tube defects and facial clefts with first-trimester exposure and cognitive teratogenicity throughout pregnancy.
- Levetiracetam and lamotrigine have not been linked to malformations, while other ASMs show conflicting results or limited data.
- Pharmacologic therapy should be optimized before conception, and any medication withdrawal should be completed beforehand.
- Experts recommend supplemental **folic acid**, 0.4–4 mg daily, starting before pregnancy and continuing through at least the first trimester, preferably throughout pregnancy, for those on ASMs.

Human Immunodeficiency Virus Infection

- In individuals newly diagnosed with human immunodeficiency virus (HIV) or not previously receiving antiretroviral therapy (ART), treatment should start as soon as pregnancy is determined since earlier viral suppression reduces perinatal transmission risk. ART is chosen from those recommended for nonpregnant adults, considering each medication's teratogenic profile. Individuals already on ART should continue their regimen if viral suppression below detection is documented.
- Recommendations for combination ART change frequently; the latest clinical guidelines are available at *http://aidsinfo.nih.gov*.
- Pregnant individuals with HIV RNA above 1000 copies/mL approaching delivery should have a cesarean section at 38 weeks to reduce perinatal HIV transmission risk. Cesarean is not recommended if HIV RNA is at or below that level. If viral load is greater or unknown, IV **zidovudine** should start with a 1-hour load (2 mg/kg), followed by a continuous 2-hour infusion (1 mg/kg/h), totaling at least 3 hours. Those with viral loads at or below 1000 copies/mL near delivery do not need IV zidovudine but should continue ART.

Depression

- Screen all patients for depression and anxiety at the first prenatal visit, during the peripartum period, and at postpartum visits.
- First-line treatments include psychotherapy and medications, which should not be withheld due to pregnancy or lactation.
- Use the lowest effective dose but recognize dosages may need to increase during pregnancy due to heightened metabolism or elimination.
- Selective serotonin reuptake inhibitors (SSRIs), such as **sertraline** or **escitalopram**, are first-line treatments for depression and anxiety during pregnancy. **Serotonin-norepinephrine reuptake inhibitors** (SNRIs) and atypical antidepressants are also used.
- Using SSRIs later in pregnancy is linked to persistent pulmonary hypertension in newborns and poor neonatal adaptation syndrome, which is typically mild. **Second-generation antipsychotics** can treat treatment-resistant depression but may cause weight gain, gestational diabetes, and metabolic syndrome, impacting obstetric outcomes. **Tricyclic antidepressants** aren't major teratogens but may cause neonatal withdrawal if used late in pregnancy. **Buspirone** is preferred for anxiety, as benzodiazepines are not recommended.

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- Mood stabilizers like **lithium**, **lamotrigine, carbamazepine, valproic acid**, and second-generation antipsychotics often treat bipolar disorder. Lithium requires monitoring during pregnancy and postpartum due to possible newborn toxicity.

LABOR AND DELIVERY

Preterm Labor

- Preterm labor occurs before 37 weeks with cervical changes and regular contractions or when presenting with regular contractions and at least 2 cm dilation.

Tocolytic Therapy

- Tocolytic therapy postpones delivery to maximize antenatal steroid effects, transport the mother to a high-risk facility, and prolong pregnancy for self-limited issues causing labor. Tocolytics start with regular contractions and cervical change but aren't used before neonatal viability or after 34 weeks.

- In the United States, tocolytics include **β-agonists**, magnesium sulfate, NSAIDs, and **calcium channel blockers**. Prolonging pregnancy with tocolytics doesn't significantly reduce rates of respiratory distress syndrome, neonatal death, or preterm birth before 37 weeks.

- The β-agonist **terbutaline** poses higher adverse effect risks for pregnant individuals. A common dose is 250 mcg subcutaneously, repeatable every 15–30 minutes if needed, with a 500 mcg maximum in 4 hours.

  ✓ An FDA black box warning advises against oral dosing or prolonged parenteral use (over 48–72 hours) due to cardiotoxicity and potential death for the pregnant individual.

- Intravenous **magnesium sulfate** is mainly used for fetal neuroprotection and reducing cerebral palsy incidence. It may be combined with another short-term tocolytic if short-term labor continues.

  ✓ Adverse effects include warmth, flushing, diaphoresis, nausea, loss of deep tendon reflexes, and respiratory depression.

- **Nifedipine** has fewer adverse effects than magnesium or β-agonists and lowers the risk of delivery within 7 days compared to β-agonists.

  ✓ It can cause dizziness, flushing, and hypotension.

- **Indomethacin** is preferred for patients receiving magnesium sulfate. It can be dosed 50–100 mg orally or rectally, then 25–50 mg orally every 6 hours for 48 hours.

  ✓ Premature constriction of the ductus arteriosus has been reported.

Antenatal Glucocorticoids

- Antenatal **corticosteroids** enhance fetal lung maturation to prevent respiratory distress syndrome, intraventricular hemorrhage, and infant mortality in premature births.

- Current recommendations are **betamethasone,** 12 mg IM every 24 hours for two doses, or **dexamethasone,** 6 mg IM every 12 hours for four doses, for pregnant individuals between 24 and 34 weeks at risk for preterm delivery within 7 days. Benefits start within 24 hours.

Group B *Streptococcus* Infection

- Prenatal screening (vaginal/rectal cultures) for group B *Streptococcus* at 36–38 weeks' gestation is recommended. Antibiotics are given if cultures are positive, or if the patient had a previous infant with group B *Streptococcus* disease, or group B *Streptococcus* bacteriuria.

- The recommended regimen for group B *Streptococcus* is penicillin G IV every 4 hours until delivery. Alternatives include ampicillin IV every 4 hours, cefazolin every 8 hours, clindamycin IV every 8 hours, or **erythromycin** every 6 hours. In penicillin-allergic individuals resistant to

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clindamycin and erythromycin, **vancomycin** IV every 8 hours until delivery can be used.

Cervical Ripening and Labor Induction

- Prostaglandin E_2 analogues (eg, **dinoprostone** [Prepidil Gel and Cervidil Vaginal Insert]) are used for cervical ripening. **Misoprostol,** a prostaglandin E_1 analogue, is effective and inexpensive that can be administered intravaginally, orally, sublingually, and buccally.

  ✓ Misoprostol has been associated with uterine hyperstimulation, meconium-stained amniotic fluid, and uterine rupture.

  ✓ Fetal heart rate monitoring is required with Prepidil and Cervidil.

- **Oxytocin** is the most commonly used agent for labor induction after cervical ripening.

Labor Analgesia

- Massage, water immersion, acupressure, acupuncture, relaxation, and hypnotherapy are used for pregnancy pain management. Visualization, breathing techniques, yoga, massage, acupressure, and partner support ease pain during labor.
- The IV or IM opioids (ie, **fentanyl, morphine**, **butorphanol**) are used for pain associated with labor. They are less effective than epidural analgesia.
- Epidural analgesia involves administering an opioid and/or an anaesthetic (eg, **fentanyl** and/or **bupivacaine**) through a catheter into the epidural space to provide pain relief. Patient-controlled epidural analgesia results in a lower total dose of local anaesthetic.

  ✓ Epidural analgesia is associated with prolonged labor and rarely puncture of the subarachnoid space. Complications of epidural analgesia include hypotension, itching, and urinary retention.

- Other options for labor analgesia include nitrous oxide, spinal-epidural analgesia, and nerve blocks.

Postpartum Hemorrhage

- Postpartum hemorrhage (PPH) is an obstetrical emergency and is a major cause of morbidity and mortality worldwide.
- **Oxytocin** administration results in reduced blood loss, fewer cases of PPH, and a shorter third stage of labor for the pregnant patient. Other agents to use include **methylergonovine**, **carboprost**, and **tranexamic acid**.

MEDICATION USE DURING LACTATION

- Medications enter human milk through passive diffusion of nonionized, non–protein-bound drugs. Medications with high molecular weight, low lipid solubility, and high protein binding are less likely to enter milk or do so more slowly and in smaller amounts. Higher serum concentrations in the lactating individual lead to higher milk concentrations. Medications with longer half-lives are more likely to sustain higher levels in milk. The timing and frequency of feedings and the amount of milk the infant ingests are also important.
- Strategies to reduce infant risk from medication in human milk include selecting medications safe for infants and choosing those with shorter half-lives, higher protein binding, lower bioavailability, and lower lipid solubility.
- Galactogogues are not recommended first-line for increasing milk production due to inconclusive evidence and potential adverse effects. Nonpharmacologic measures such as massage, eating snacks, increasing hydration, and consulting a lactation expert should be tried first.
- *Staphylococcus* and *Streptococcus* are the most common bacterial causes of mastitis. Treatment may involve penicillinase-resistant penicillins (eg, **dicloxacillin**, **oxacillin**) or first-generation **cephalosporins**. Heat application, massage, and NSAIDs can help relieve pain.

POSTPARTUM DEPRESSION

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- Nonpharmacologic treatment may include interpersonal psychotherapy, cognitive behavioral therapy, and group/family therapy.
- The presence of a mental health condition should not discourage one from breastfeeding.
- Sertraline, paroxetine, fluoxetine, and nortriptyline are the best studied in the postpartum period and selecting medications with low milk transfer is desirable.
- **Brexanolone** and **zuranolone** treat postpartum depression.

See Chapter 105, Pregnancy and Lactation, authored by Alicia B. Forinash and Kylie Barnes, for a more detailed discussion of this topic.

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